

The background of the slide is a photograph of a Montana landscape. It features rolling hills in the foreground with sparse green and yellow vegetation. In the middle ground, there are clusters of green trees. The background is dominated by large, rugged mountains with flat tops under a clear blue sky.

# **Workforce, Science, and Technology:**

## **Historic, Current, and Future Contributions to a Montana Restoration Economy**

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# Land Grant Mission

"The College of Agriculture (CoA) and the Montana Agricultural Experiment Station (MAES) generate and disseminate superior knowledge and technological solutions to increase the competitiveness of Montana's agricultural and natural resources, preserve environmental quality, and improve the quality of life for all our citizens."

"Montana State University provides education, research, and extension/outreach programs focused to meet the changing needs of Montana."

## Long-term Leadership

1905: F. W. Traphagen sought permission from F.B. Linfield to publish MAES experimental data pertaining to the impacts of smelter smoke, tailings, and waters on vegetation and animal life in the Deer Lodge Valley.

MAES and MSU personnel played significant roles in the infamous federal “smelter smoke” lawsuit, in which the Anaconda Trust was charged by Deer Lodge Valley farmers with damaging vegetation, cattle, and sheep.

Working extensively in Clark Fork Basin since 1980s.





# Reclamation Research Unit

RRU initiated during late 1960s

Significant contributions to Montana's economy by providing solutions to land management problems

Many reclamation methods, techniques, and protocols used in this region were developed by the RRU

Billings Land Reclamation Symposium – 25 years!



A photograph of a person wading in a river, surrounded by tall reeds and a cloudy sky. The person is wearing a blue jacket and a blue cap, and is holding a long pole. The water is rippling around their legs. The background shows a line of trees and a cloudy sky.

MSU/LRES remains committed to providing leadership in restoration science, training, and technology.

We are transitioning towards a comprehensive new Restoration-Reclamation Unit.

We seek continued input, partnerships, collaboration with agencies, industry, citizens.

# Capabilities: Integrated Disciplines

## Restoration/Reclamation

Restoration Ecology  
\*Reclamation Science  
Environmental Risk Analysis

## Soil Science

Chemistry  
Physics  
Microbiology  
Nutrient Cycling  
Pedology/Landscape Analysis  
Ecology/Mycorrhizae

## Spatial Analysis

Remote Sensing  
GIS and GPS  
Spatial Modeling  
Environmental Statistics (3)

## Water and Hydrology

Water Quality  
Hydrology  
Biogeochemistry  
Limnology  
Fish Biology and Mgt. (3)  
Watershed Analysis/Modeling

## Plant/Vegetation Science

Plant Ecology  
Riparian Ecology  
Mycorrhizal Ecology  
Weed Ecology/Management (3)  
Soil/Plant Nutrition

## Wildlife and Entomology

Wildlife Science/Management (5)  
Entomology and Biocontrol (5)



# Research

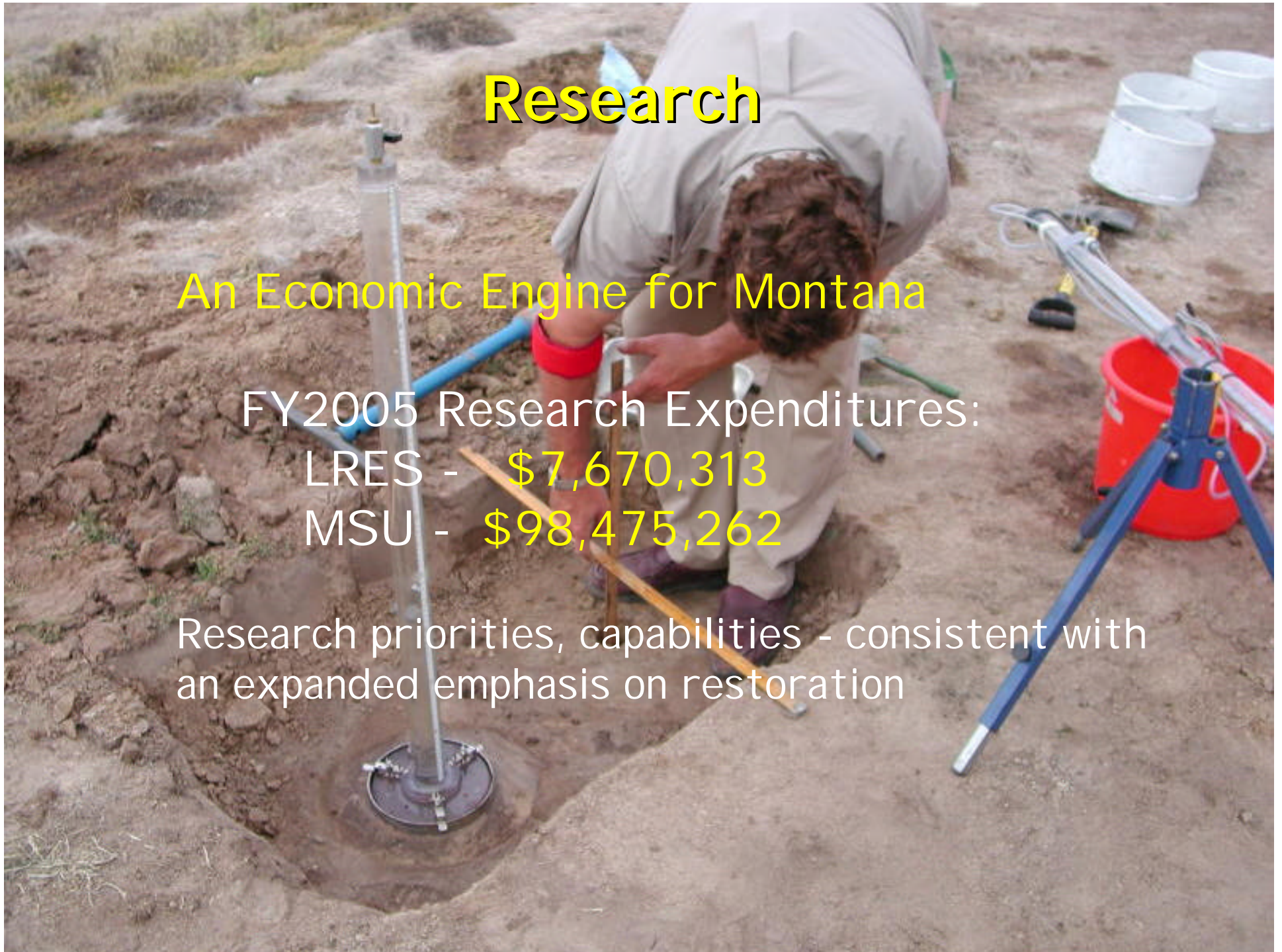
## An Economic Engine for Montana

FY2005 Research Expenditures:

LRES - \$7,670,313

MSU - \$98,475,262

Research priorities, capabilities - consistent with an expanded emphasis on restoration





# Integration of Research and Teaching

## Capstone course topics

- 2001-02 Fire effects on soils/veg/water
- 2003-04 Bullion Mine reclamation revisited
- 2005-06 B Bar Ranch inventory/management
- 2007-08 New Restoration theme...

## Undergraduates in research labs

Original research, student hourly workers







# Workforce: Degrees Offered

## B.S. (~450 students)

Land Rehabilitation  
Soil and Water Science  
Environmental Biology  
Land Resources Analysis/Mgt.  
Agroecology  
Fish & Wildlife Mgt.  
Nat. Resources/Rangeland Ecol.  
Geology  
Geohydrology

## M.S. (~75 students)

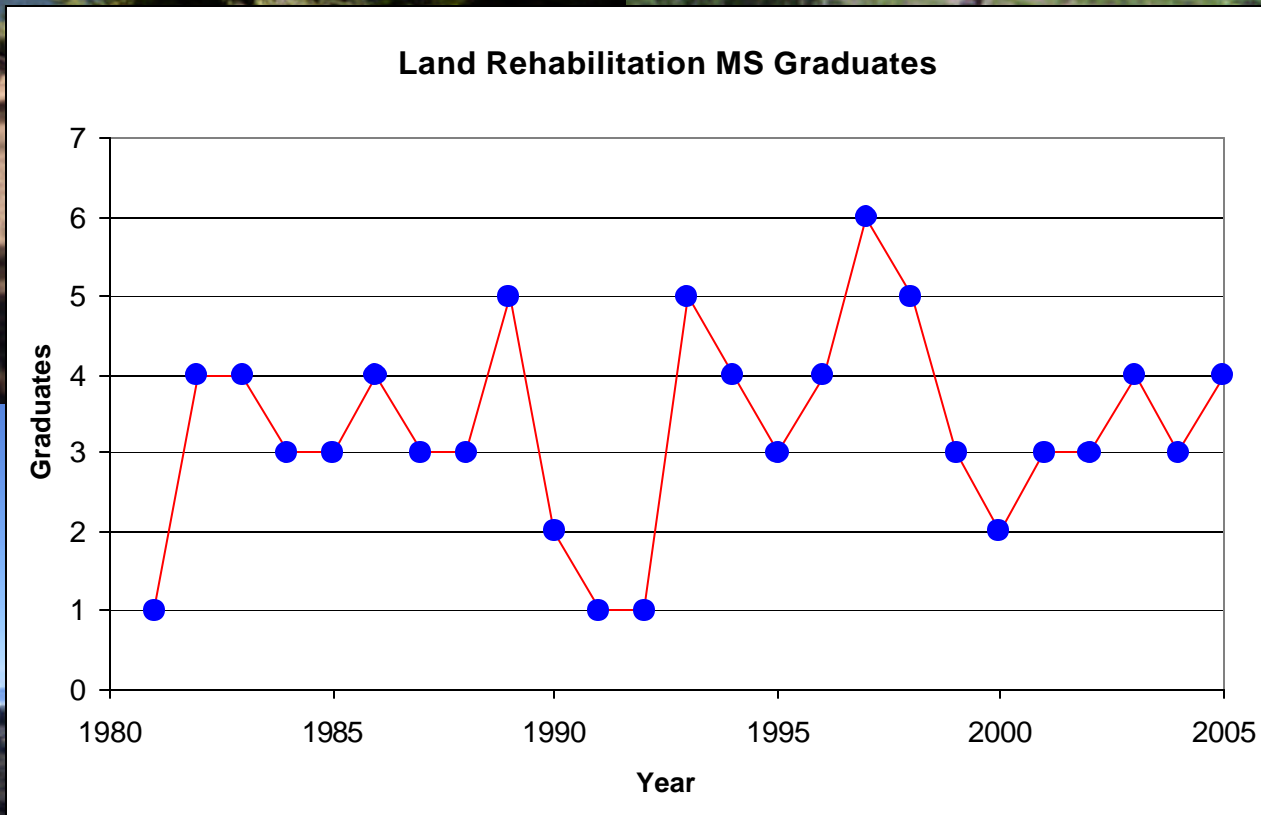
Land Rehabilitation  
Land Resources/Environmental Sci.  
Fish & Wildlife Mgt.  
Earth Science  
Range Science  
Ecology & Environmental Statistics

## Ph.D. (~40 students)

Land Resources/Environmental Sci.  
Fish and Wildlife Biology  
Biological Sciences  
Earth Science



# Workforce: Land Rehabilitation M.S.



83 M.S. graduates.

Many are leaders in industry, agencies, academia.



A group of people, likely graduates, are gathered in a grassy field with several tents and a dense forest in the background. Some people are sitting on the grass, while others are standing. A man in a green shirt and cap is standing in the center, possibly addressing the group. A large green trash can is visible in the foreground. The scene is outdoors, with tall grass and trees in the background.

Graduates enhance Montana and regional restoration/natural resources/agricultural economies; provide economic opportunities for others to enter the workforce.

[Who knows; one might even become the Governor someday...]



# Research and Technology Transfer



Issued patents	47	
Issued foreign patents	38	
Pending US patents	86	
Pending foreign patents	60	
Issued trademarks	5	
Exclusive licenses	72	(52 MT)
Non-exclusive licenses	5	(1)
Experimental licenses	5	(2)
Options to lease	27	(15)





# Opportunities: Unlimited!

## Challenges? Absolutely!

### Workforce:

- 1) Extensive, relevant coursework;
- 2) Affordability (tuition/fees, stipends)
- 3) Integrating practical job experiences

### Science:

- 1) Separate realities?
- 2) Funding sources

### Technology:

- 1) Willing, capable, not very familiar...



# Solutions: Public-Private Partnerships

A photograph of three young women standing in a grassy field with mountains in the background. The woman on the left is wearing a white t-shirt and dark pants, holding a red and black tool. The woman in the middle is wearing a light blue polo shirt and jeans. The woman on the right is wearing a dark blue long-sleeved shirt, jeans, and sunglasses, holding a yellow object. They are all smiling at the camera. The background shows a grassy hillside with trees and distant mountains under a clear blue sky.

## Science/Workforce:

New faculty positions in key areas

Industry/Agency research needs dialogue

## Students/Workforce:

Internships, summer jobs, work experiences...

- Tuition/fee waivers, scholarships, ...



# Solutions: Public-Private Partnerships



## Technology:

Industry-University-Agency partnerships.  
Develop and prioritize, evaluate, commercialize...

## Other ideas/opportunities?

Consistent with respective missions; clear benefits  
for all parties.



# Montana Restoration Economy

Drivers wanted!

